Periscope.

a.—NORMAL HISTOLOGY OF THE NERVOUS SYSTEM.

NERVE-ENDINGS IN EPITHELIUM.—Although the details of structure of nerves and nerve fibres in their continuity are fairly well known, we are still very much in doubt as to the exact way in which they begin and end. Pfitzner[1] calls attention anew to the complexity of the chemical reactions of preservative and staining agents in the tissues through which, for the most part, their minute structure is rendered visible. In living structures the molecular condition is constantly changing, and it is not at all improbable that the structure may be at one time in a condition favorable to a certain reaction, and at another not. Moreover, it has usually been assumed that any agent which would stain or render visible one portion of any particular structure would affect all portions in the same way. Thus it is assumed that because gold chloride stains nerves in their continuity, it will necessarily stain their terminations in the same way. Where the characteristic gold precipitate stops, there, it is assumed, the nerves end, and wherever it is found, there are nerves. The fallacy of these assumptions has been often emphasized, and Pfitzner urges in view of them the necessity of resorting to various modes of staining in histological research. His method of demonstrating the nerve-endings in epithelium is to harden in chromic acid; make thin sections, and after carefully washing out the acid put for ¼ to ½ hour in 1 % sol. gold chloride in the dark; then after carefully washing to leave in the light for 12–24 hours in 5 % sol. formic acid. The sections are then mounted in glycerine, with or without staining with safranin. For purposes of control he places sections from tissue hardened in chromic acid for ½ hour in ½ % osmic acid and mounts in glycerine.

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[1] Pfitzner: Nervenendigung im Epithel.—*Morphologisches Jahrbuch*, Bd. vii, p. 727.

He finds in the skin of frog's larvæ that the nerves, as they pass into the outer layers of the corium, divide dichotomously and send branches into the epithelial cells of the deeper layer—two branches into each cell. These terminal nerves do not enter the nuclei but end in free, slightly bulbous extremities, sometimes curling over within the cell-body. The two branches in a single cell never come from the same, but from adjacent trunks. The pictures obtained in adults and in higher animals are not as distinct, but the author has seen enough to convince him that the same mode of termination occurs in higher animals and in man.

NERVES AND GANGLIA IN FROG'S HEART.—By exposing the inner surface of the opened ventricle of the frog's heart to the vapor of osmic acid, Dogiel[1] has succeeded in demonstrating that the nerves and nerve cells are by no means confined to the vicinity of the auriculo-ventricular valves, but that double contoured fibres ramify over the inner surface of the wall of the ventricle beneath the endothelium, as well as among the muscles. Numerous ganglion cells, single and in groups, are found in the upper third of the ventricle, to which Dogiel suggests applying the name *ventricular ganglia*, in distinction from the auriculo-ventricular ganglia of Bidder.

THE STRUCTURE OF LIVING NERVES AND NERVE CELLS.—The precision in detail which the modern methods of preservation and staining lend to the structural elements is so satisfying that observers are prone to forget that studies of dead structures alone cannot furnish an accurate conception of the nature and characters of a tissue, and it is daily appearing more probable that many of the features which we are wont to ascribe to histological elements are, to a certain degree, artificial. This consideration lends great value to every painstaking and objective study of living tissue, although these for the most part do not lead to striking disclosures.

The studies of Freud[2] on living nerve-fibres and nerve cells of the fresh-water crawfish are of considerable general interest from this point of view. The fibres and cells were studied with as little teasing as possible in the transparent blood of the freshly killed animal. Under these conditions the fibrillated character of the fibres and cells was readily seen. The nerve-cells of the brain and abdominal ganglia consist of two substances, one of which is arranged in the form of a net-work of fibrils, continuous with the fibrils of the nerve fibres; the other, homogeneous and less strongly refractile, is connected with the inter-fibrillar substance of the fibres. The nucleus of the living ganglion cells consists of a nearly homogeneous body, scarcely outlined against the substance of the cell. As the cell dies the contour of the nucleus becomes more and more distinct, and it at last presents a well-defined double contour; at the same time the intracellular net-work becomes less distinct and the cell-body more granular. Within the nucleus are seen strongly refractile bodies of various forms—spheroidal, rod-like, angular, or forked,—which in the living cell are often in a state of continuous movement, sometimes swaying to and fro with such rapidity as to render the attempt to sketch them almost futile, and again changing their position slowly, or remaining quiescent. This curious movement of intra-nuclear bodies has already been described in a variety of living cells.

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[1] Dogiel, Joh.: Die Nervenzellen u. Nerven des Hertzventrikels beim Frosche. *Arch. mik. Anat.*, Bd. xxi, Heft 1, p. 21.

[2] Freud: Ueber den Bau der Nervenfasern u. Nervenzellen beim Fluskrebs. —*Sitzungsb. d. k. k. Akad. d. Wiss. Math. naturw.*, *Classe*, Abth. iii, Bd. 85, Heft 1, p. 9.

THE NERVES OF THE HUMAN EYELID.—The gap in our knowledge concerning the distribution of nerves in the eyelid, left by the exclusive description of the larger trunks by the anatomists on the one hand and by the studies of nerve-terminations by histologists on the other, furnishes the motive for the investigations of von Mises.[1] Using as reagents potash, osmic acid, and gold chloride, he finds that the nerve-trunks enter the lid from the sides and from above. Of the lateral trunks the inner is the larger. These trunks pass horizontally across the lid, supplying the region above the tarsus and forming anastomoses with each other and with branches entering from above. Branches pass to the vicinity of the sebaceous glands of the lashes, where they form a dense marginal plexus. From this plexus fibres pass to the skin, muscles, lashes, and conjunctiva. The nerves going to the eyelashes form around the root-sheaths near the excretory ducts of the sebaceous glands a narrow-meshed annular plexus, somewhat similar to the "*anneau sensitif*" described by Jobut in the hairs of the beard, and by others in the tactile hairs of lower animals. The eyelashes, then, according to the author's view, are not merely mechanical, but acutely sensitive protectors of the delicate organ within.

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[1] F. von Mises: Ueber die Nerven der menschlichen Augenlider.—*Sitzb. d. k. k. Akad. d. Wiss. Math. Naturw., Classe*, Abth. iii, Bd. 85, Heft 3, p. 172.

BLOOD-VESSELS OF THE HUMAN SPINAL CORD.—Although too minute and extended in detail to permit of a *résumé*, attention should be directed to the second paper of Adamkiewicz[1] on this subject. The first paper, noticed in the July Periscope, having described in detail the distribution of blood-vessels within the cord, this is confined to the minute description of those which ramify externally.

THE STRUCTURE OF NERVES AS DEMONSTRATED BY TRYPSIN DIGESTION.—When, in 1877, Ewald and Kühne announced the partial digestion of tissues by trypsin as a new method of histological demonstration, and sustained their suggestions with some striking results obtained with it, especially on nerves, it seemed that a new era in histological technique might be about to dawn. If it was possible by a simple chemical agent like the pancreatic ferment to digest and remove certain parts of structures, leaving others unchanged, what immediate additions to our knowledge might be confidently expected.

By treating, among other things, peripheral nerves with boiling alcohol and ether to remove water and fat, and digesting with trypsin, these observers were able to demonstrate that inside the neurilemma and around the axis-cylinder were delicate tubular structures, and between these stretched a net-work of the same resistant nature, which they called neurokeratin. In the meshes of this net-work, and between the outer and inner cylinders, lies the myelin. This neurokeratin was also found abundantly in the central nervous system.

Without further recalling the details of structure arrived at by this method in nerves and elsewhere, suffice it to say that while the views advanced in regard to nerve structures have been accepted by such observers as Schwalbe, Hoppe-Seyler, and others, in the minds of many trained investigators much doubt still lingered as to the ultimate value of the method and the belief that its limitations had not been fully ascertained. Careful investigations by Hesse, Perlich, and others, tended to confirm this doubt. With the hope of arriving at a definite conclusion in the matter Waldstein and Weber[1] have instituted a series of experiments with trypsin, studying its action, among other things, on the peripheral nerves and the central nervous system. They arrive at the conclusion that the neurokeratin of Ewald and Kühne is an artificial product formed by the breaking up of myelin by the reagents employed, and that the inner and outer myelinic sheaths and their associated net-work do not exist in the nerves in their natural condition.

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[1] Adamkiewicz: Die Blutgefässe des menschlichen Ruckenmarkes.—*Sitzungsb. d. k. k. Akad. d. Wiss. Math. naturw., Classe, Abth.* iii, Bd..85, p. 107.

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b.—PHYSIOLOGY OF THE NERVOUS SYSTEM.

GUACHAMACA.—This drug comes from Orinoco, Venezuela, and experiments were made by Dr. Schiffer with the extract. The plant belongs to the apocynaceæ, a family which has furnished many therapeutic and toxic preparations. The chemical and physical relations of this drug resemble those of curare, and it was found that a great similarity existed in their physiological peculiarities. When given to a rabbit it paralyzed the motor

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[1] Waldstein and Weber: Études histochemiques sur les tubes nerveux a myéline.—*Arch. de phys. nor. et path.*, July, 1882.